Adaptive Management Section
Chapter 3, Conservation Strategy
December 2, 2008 Draft

Note to Reviewers: Note to Reviewers: *the following is a draft of a portion of the adaptive management section (section 3.6) of Chapter 3, Conservation Strategy, of the BDCP. Details of approaches to adaptive management for implementation of conservation measures are described under each of the conservation measures in Section 3.4 and the monitoring and research that would be undertaken to support adaptive management decision making is presented in Section 3.5, Monitoring Plan.*

In this draft, the term "Implementing Entity" is used to refer generically to the agency or agencies that would implement the BDCP. It is understood that the Implementing Entity could be one entity or multiple entities under an implementation structure. As such, the term "Implementing Entity" is used here as a placeholder until the specific entity or entities responsible for various aspects of implementation are identified.

The following sets out the rationale for an adaptive management process that has emerged through the deliberations of the Governance Work Group. The Work Group expects to further refine these concepts and, as such, the concepts as described below do not currently reflect a consensus of the group.

3.6 Adaptive Management

This section describes the process that would be used by the BDCP implementing entity(ies) to ensure that the adaptive management program improves the effectiveness of the conservation strategy and to be responsive to the changing ecological conditions in the Delta that may occur over time and that appropriate adjustments to the implementation of the BDCP conservation measures are made to further biological goals and objectives of the plan. The BDCP adaptive management process is consistent with the guidance for adaptive management provided in the U.S. Fish and Wildlife Service's Five-Point Policy for HCPs (65 FR 106, June 1, 2000) and through the provisions of the Natural Community Conservation Act (NCCPA) (Fish and Game Code Sections 2800-2835). The Five-Point Policy for HCPs broadly defines adaptive management "…as a method for examining alternative strategies for meeting measurable biological goals and objectives, and then if necessary, adjusting future conservation management actions according to what is learned." The NCCPA defines adaptive management as follows: "…to use the results of new information gathered through the monitoring program of the plan and from other sources to adjust management strategies and practices to assist in providing for the conservation of covered species."

The conservation measures described in section 3.4 were developed on the basis of the best scientific and commercially available information. These conservation measures set out detailed actions to achieve the plan's biological goals and objectives. Over the term of the BDCP, however, new data and information would be developed that would help reduce uncertainties regarding the effectiveness of conservation measures and provide

insight into the potential for substantial changes in Delta conditions that may result from climate change (e.g., sea level rise and hydrology in the Delta watershed), seismic events, potential large scale changes in land use, and other factors. As more is understood about the Delta ecosystem, modifications to the implementation of the BDCP conservation measures would be necessary. The adaptive management process affords the implementing entity flexibility to make these adjustments to address substantial existing and future uncertainties, including modifications, removal, and additions to conservation measures and changes to the monitoring program as indicated by new scientific information (i.e., results of relevant monitoring and research).

Decisions by the implementing entity to modify plan implementation would be guided by information gathered through the monitoring program and through research efforts such as those described in the conservation measures and monitoring plan. BDCP monitoring and research programs are designed to establish cause and effect relationships between implementation of specific conservation measures and the type and magnitude of species responses to those measures, as well as species responses to the implementation of combinations of conservation measures. Should strong cause and effect relationships be established, adaptive management provides the mechanism to concentrate efforts on the implementation of conservation measures that have been demonstrated to be more effective and to deemphasize or discontinue implementation of conservation measures that prove to be less effective at achieving desired species outcomes. For example, if restoration of tidal marsh is shown to provide little benefit to covered fish species and actions to further reduce levels of a specific contaminant proves to yield increasing benefits to fish, then the tidal marsh restoration may be reduced or discontinued and its funding diverted to additional contaminant reduction actions. Similarly, conservation measures related to water operations may be modified to benefit water supply if information and analysis suggests that other conservation measures provide greater benefits to covered fish species.

The adaptive management process would guide the implementation of a range of actions and related to the BDCP Conservation Strategy, including:

- Methods and approaches for implementing habitat restoration, water operations, and other stressors conservation measures;
- determining water operations parameters;
- revising, discarding, and adding to conservation measures;
- determining funding levels for conservation measures;
- establishing priorities and timetables for implementing actions;
- determining research and adaptive management experiments conducted to inform implementation; and
- identifying adaptive management triggers.

Implementation elements of the monitoring plan subject to adaptive management include:

- identifying the subjects of monitoring,

- determining the duration and scope of monitoring, and
- establishing monitoring methods and metrics.

In addition to providing the Implementation Entity with a process to better ensure effective BDCP implementation, outcomes of applying the adaptive management process are anticipated to be an important factor in the Implementing Entity's annual and long-term budgeting and funding decision making processes.

The BDCP adaptive management process would be administered by the Implementing Entity. Adaptive management roles and responsibilities among Implementing Entity, the Fishery Agencies, and BDCP applicants and participants is described in Chapter 7, *Implementation Structure*.

3.6.1 Adaptive Management Decision Making Process

The BDCP contemplates changes in implementation actions over time to address uncertainties and provide for improvements to the effectiveness of conservation measures in achieving biological goals and objectives as new scientific information is developed. The process described in this section and illustrated in Figure 3.X is intended to provide for such changes without requiring amendments to the BDCP.

The adaptive management process provides for adjustments in the implementation of the conservation measures and adjustments to the monitoring plan by the implementing entity that are routine decisions that do not require changes to the water management as described in section 3.4.2 *Water Operations Conservation Measures* or increase costs beyond the level of funding allocated for specific uses (chapter 8 *Implementation Costs and Funding Sources*). That is, routine decisions are those that do not affect the specific commitments set out in the BDCP. For example, under the adaptive management process, the implementing entity could modify methods for implementing a conservation measure based on new scientific information indicating that doing so would be likely to improve its effectiveness. A primary purpose of the routine adaptive management process is to provide for timely and effective implementation decision making by the BDCP Implementing Entity.

Non-routine adaptive decision making would likely include input from the permittees, Fishery Agencies, and other BDCP participants (as identified in the BDCP or associated documents) to implement substantial changes to BDCP implementation. Non-routine or substantial adjustments to BDCP implementation include the following types of changes:

- reallocation of funding for the implementation of different Conservation Strategy elements (i.e., conservation measures, adaptive management, monitoring)
- revisions to BDCP conservation measures, including changes in performance criteria and removal of a measure from the Conservation Strategy;
- the addition of new conservation measures to the Conservation Strategy;

- adjusting water operations to achieve parameter values outside the operating range indicated in Tables 3.X and 3.X;
- major modifications to the monitoring plan, including discontinuing a monitoring effort, changing monitoring metrics, and adding new monitoring efforts; and
- adjusting adaptive management triggers established for conservation measures.

The range of adaptive management responses, however, is limited by the total funding committed to implement the BDCP (see Chapter 8, *Implementation Costs and Funding Sources*), the parameters within which adaptive management of water operations may occur, the targets identified by habitat restoration conservation measures (see section 3.4 *Conservation Measures*), and regulatory assurances provided under the ESA and the NCCPA.

The Implementing Entity would establish an internal process of review by technical experts (e.g., biologists, restoration ecologists, physical scientists, habitat managers, engineers) to assess, on an annual basis, the adaptive management program, including effectiveness and performance monitoring results, research and adaptive management experiments, and of relevant new scientific information developed by others (e.g., universities, CALFED Bay-Delta Program, Interagency Ecological Program) to determine whether changes in the implementation of the conservation measures and the monitoring plan would be desirable to improve effectiveness of the BDCP in achieving biological goals and objectives. Based on results of these annual reviews, recommendations would be formulated for adjusting BDCP implementation of conservation measures and modifications to the monitoring plan. The implementing entity may also seek the assistance of the Fishery Agencies and knowledgeable outside scientists and experts in conducting their reviews and formulation of recommendations.

Adaptive management recommendations formulated through the internal science review process would include a description of the recommended change in implementation; a description of the justification for the recommended change; an assessment of effects the change may have on other elements of BDCP implementation, if any; and any other relevant information in support of the recommendation. The Implementing Entity would review recommendations provided through the internal science review process and determine if the recommendations are routine and could be implemented on approval by the implementing entity or would require substantive changes to implementation and likely need input from the the permittees, the Fishery Agencies and other BDCP participants as appropriate to implement. Adopted changes in implementation would be reflected in the subsequent year's BDCP implementation work plan, although if appropriate, the change could be instituted by the implementing entity upon adoption of the work plan. The implementing entity would document the rationale for rejection of adaptive management recommendations.

Unforeseen circumstances would not be addressed through the adaptive management process, but would be addressed through the processes described in section 3.6.7 *Approach to Addressing Unforeseen Circumstances*.

3.6.3 Adaptive Management Triggers

Adaptive management triggers are quantified thresholds established for some conservation measures that, if exceeded, would require a management response by the Implementing Entity to improve results through a mandatory adaptive management process review. Adaptive management triggers for applicable conservation measures are summarized in Table 3.X and described in section 3.4 *Conservation Measures* for each conservation measure.

Table 3.X. Adaptive Management Triggers for Implementation of Conservation Measures

Conservation Measure	Adaptive Management Trigger

3.6.4 Adaptive Management Experiments

Adaptive management considerations are described for each conservation measure in Section 3.4 *Conservation Measures*. These considerations would be addressed by the Implementing Entity through monitoring (see section 3.5 *Monitoring Plan*), design of conservation implementation plans, and adaptive management experiments.

A large number of uncertainties exist regarding the effectiveness of techniques for successfully implementing conservation measures or their effectiveness in achieving the biological goals and objectives. The adaptive management process is designed to address these uncertainties. Uncertainties associated with implementation of a conservation measure for which the outcomes are unlikely to pose a substantial risk to achieving the biological goals and objectives would be addressed by the Implementing Entity through designing implementation of applicable conservation measures to minimize uncertainties and adjusting implementation as needed based on monitoring results through routine adaptive management decision making.

To address uncertainties that, if not addressed, could pose a substantial risk to achieving biological goals and objectives, initial site-specific projects for implementing conservation measures for which these uncertainties exist would be designed by the Implementing Entity as adaptive management experiments (i.e., pilot or demonstration projects). Conservation measures that are anticipated to initially be implemented as adaptive management experiments are listed in Table 3.X and the experiments to be conducted are described for each of the conservation measures in Section 3.4 *Conservation Measures*. Designs for each adaptive management experiment would be developed as described in Section 3.5, *Monitoring Plan*, and would be developed based on the best scientific information available at the time the experiment is initiated. Design and implementation of experiments involving water operations conservation measures would be coordinated with DWR and Reclamation.

Table 3.X. Conservation Measures for Which Adaptive Management Experiments are Anticipated

Conservation Measure	Brief Description of Hypothesis Tested
[*Text to come*]	[*Text to come*]

Results of adaptive management experiments would be reviewed through the internal science review process and presented to the Implementing Entity. Experiment results would be used to determine future implementation of the conservation measure(s) in question.

If implementation of an adaptive management experiment results in benefits to covered species, the experiment could be considered as part of implementation of the conservation measure in compliance with BDCP authorizations.

3.6.5 Program Status Reviews

[*To come. This section will describe program status reviews that may be conducted by the Implementing Entity. Status reviews would focus on review of technical elements of BDCP implementation procedures (e.g., administrative reviews of the effectiveness of Implementing Entity processes and procedures, agreements with other parties, need for updates to guidance documents [e.g., monitoring protocols and plans], implementation infrastructure [e.g., data bases, computer systems].) and species status reviews. Technical reviews provide for ongoing improvement in the Implementing Entity's effectiveness by providing for periodic critical and methodical review of its implementation procedures. Periodic reviews of the status of covered species would be conducted to determine if changes in BDCP implementation may be warranted based on regional population trends and new information related to species needs. Changes in BDCP implementation resulting from program status reviews would be implemented through the adaptive management decision making process.*

3.6.6 Changed Circumstances and Remedial Measures

USFWS and NMFS regulations define changed circumstances as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the [USFWS and NMFS] and that can be planned for…" (50 C.F.R. §17.3; 50 C.F.R §222.102) and the NCCP Act defines changed circumstances as "…reasonably foreseeable circumstances that could affect a covered species or geographic area covered by the plan." (Fish and Game Code §2805(c)). The BDCP Implementing Entity would implement remedial measures that address changed circumstances in the event they should occur. Changed circumstances would be deemed to occur through the process described in Section 7.X of the Chapter 7, *Implementation Structure*. Changed circumstances and remedial measures that would be

implemented by the Implementing Entity in the event of changed circumstances are described in Table 3.X.

Table 3.X. Changed Circumstances and Remedial Measures [*This table provides samples of the beginnings of the list of BDCP changed circumstances and remedial measures to address the change. Additional changed circumstances and remedial measures will be added.*]

Changed Circumstance	Remedial Measure
Restored habitats fail to provide the ecological functions described for each of the restored habitat types in Section 3.4 of Chapter 3, *Conservation Strategy*.	The cause for failure would be investigated through monitoring and research as appropriate. Once the cause is identified, the BDCP adaptive management process would be applied to identify appropriate responses to improve the ecological function of the restored habitat or implement an alternative conservation measure that provides equivalent ecological functions.
BDCP levees constructed to restore tidal marsh habitats fail and result in reducing the level of covered species and ecosystem benefits associated with the affected restored tidal marshes.	*Remedial measure discussion to come.*
Delta levee failures resulting from floods, seismic events, or other causes inhibit the ability to implement conservation measures or reduce the covered species and ecosystem benefits provided by conservation measures	*Remedial measure discussion to come.*
Restored, enhanced, and protected BDCP habitat areas are lost or degraded as a result of floods or levee failures.	Lost or degraded habitats would be reestablished or enhanced following the event. If conditions following the event are such that reestablishing or enhancing the affected habitat types is not feasible or effective, the Implementing Entity in coordination with the Fishery Agencies would restore or enhance habitat elsewhere that would provide ecological functions similar to those of the affected habitat or would implement alternative conservation measures (e.g., expanded or additional contaminant reduction measures) that provide equivalent ecological benefits for the affected covered species through the adaptive management process.
Sufficient lands cannot be secured by the BDCP Implementing Entity to implement habitat restoration conservation measures.	Through the adaptive management process, the Implementing Entity would identify and implement appropriate alternative conservation measures (e.g., expanded or additional contaminant reduction measures) in coordination with the Fishery Agencies that provide equivalent ecological benefits for the affected covered species.
A toxic or hazardous substance spill event occurs within BDCP restored, enhanced, or protected habitat areas.	The Implementing Entity would identify and undertake appropriate management measures in coordination with the Fishery Agencies that feasibly and effectively restore the affected ecological functions of BDCP habitat areas. If the affected habitat areas cannot be feasibly and effectively restored, the Implementing Entity in coordination with the Fishery Agencies would identify and implement measures to contain the ecological effects of the spill and replace the habitat elsewhere or would implement alternative conservation measures (e.g., expanded or additional contaminant reduction measures) that provide equivalent ecological benefits for the affected covered species through the adaptive management process.

Changed Circumstance	Remedial Measure
Water operations infrastructure failure precludes implementing operations within the adaptive range of values identified for operations conservation measures.	The Implementing Entity would identify and implement repairs to the affected infrastructure as soon as feasible. The Implementing Entity in coordination with the Fishery Agencies would identify appropriate adjustments to water operations to provide ecological benefits for covered fish species as close to the levels that would have been achieved before the infrastructure failure through the adaptive management process.
Implementation of one or more conservation measures must be discontinued because they result in inadvertent non-compliance with state or federal environmental laws or regulations (e.g., water quality standards)	The Implementing Entity in coordination with the Fishery Agencies would implement one or more of the following actions through the adaptive management process: ▪ modify implementation of the conservation measures to ensure compliance with the law or regulation; ▪ identify and implement alternative conservation measures (e.g., expanded or additional contaminant reduction measures) that provide equivalent ecological benefits for the affected covered species; and ▪ secure exemptions to or modifications of the law or regulation to allow continued implementation of the conservation measure(s).
Altered hydrology with climate change diminishes the ability to implement water operations conservation measures	*Remedial measure discussion to come.*
Sea level rise with climate change diminishes covered species benefits provided by conservation measures	*Remedial measure discussion to come.*
Invasion and establishment of new non-native species diminishes covered species benefits provided by restored habitats	*Remedial measure discussion to come.*
Invasion and establishment of new non-native species preclude achieving biological goals and objectives	*Remedial measure discussion to come.*
Changed ocean conditions preclude achieving biological goals and objectives for covered anadromous fish species	*Remedial measure discussion to come.*
Future listing of a non-listed covered species.	Consistent with 63 FR 35 (February 23, 1998), USFWS and NMFS would automatically authorize take of newly listed covered species within their respective jurisdictions. Consistent with Fish and Game Code §2805(c) and §2835, DFG would automatically authorize take of newly listed covered species.

3.6.7 Approach to Addressing Unforeseen Circumstances

[*Additional text will be added here to define the BDCP's approach to addressing unforeseen circumstances*]

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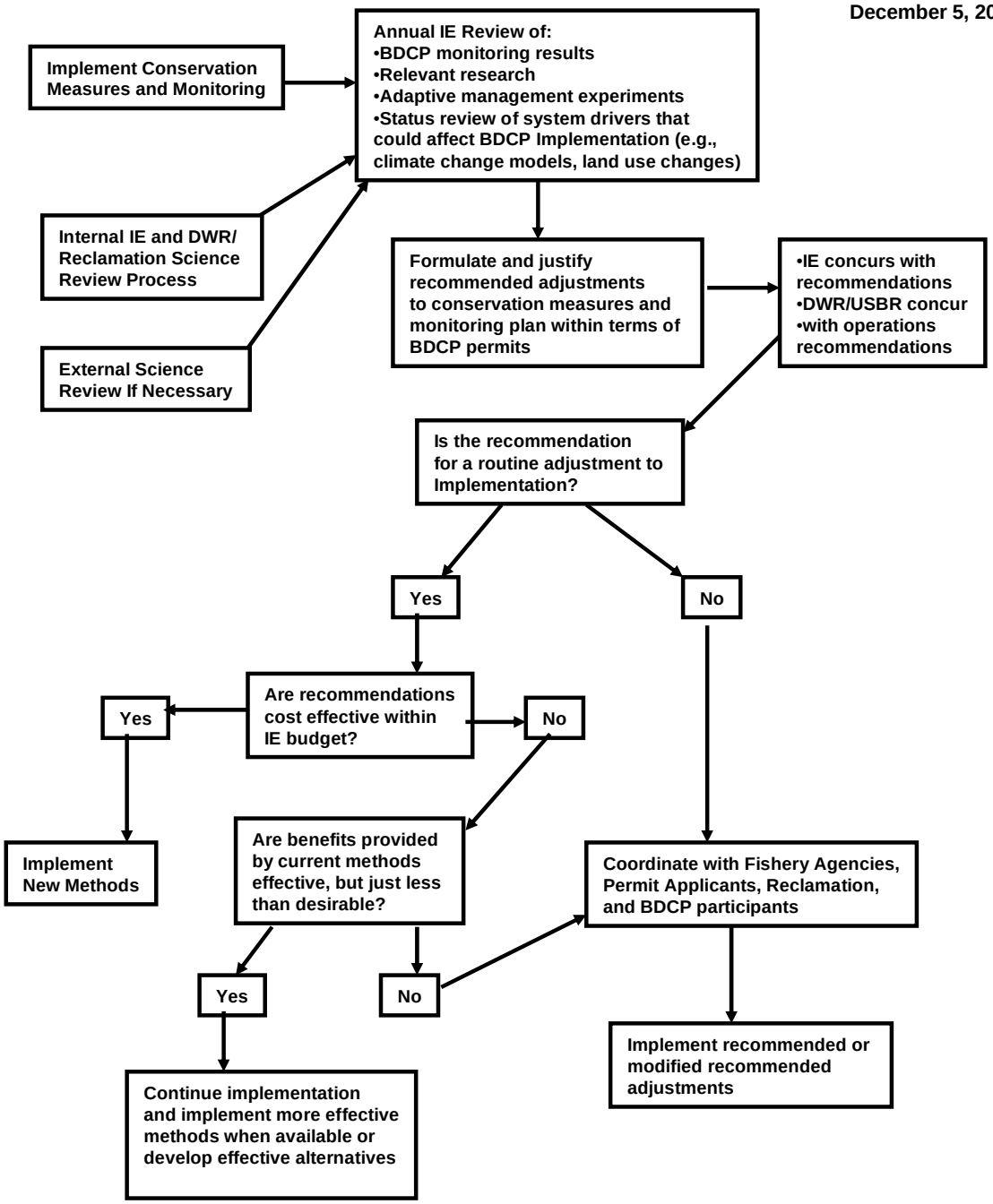

Figure 3.X
BDCP Adaptive Management Decision Making Process

IE = Implementing Entity

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